Catalogue of American Amphibians and Reptiles.

Powell, M.A., R. Powell, and R.W. Henderson. 2006. *Anolis sabanus.*

Anolis sabanus Garman 1887
Saba Anole, Lizard

Anolis sabanus Garman 1887:39. Type-locality, "Island of Saba." Lectotype, Museum of Comparative Zoology (MCZ) 6161 (designated by Lazell 1972), an adult male, collected by "Mr. F. Lagois and others" (not examined by authors).

Anolis leachii: Boulenger 1887:10 (part). See **Nomenclatural History**.

Anolis alliaceus: Günther 1988:363 (part). See **Nomenclatural History.**

Anolis bimaculatus sabanus: Underwood 1959:196. See **Comment**.

Ctenonotus sabanus: Schwartz and Henderson 1988:332. See **Remarks**.

• **CONTENT**. No subspecies are recognized.

• **DEFINITION**. *Anolis sabanus* is a moderately sized anole with a maximum SVL of 69 mm in males and 50 mm in females (Schwartz and Henderson 1991). Head scalation is characterized by 4–5 rows of loreals, 2 scales between the interparietal and supraorbital semicircles, 0–1 scales between supraorbital semicircles, 3–4 postrostrals, 4–6 postmentals, and suboculars in contact with supralabials. Scales behind the interparietal grade into dorsal scales, which are granular and swollen, with the two dorsalmost rows slightly enlarged. Smaller dorsal granules lateral to the middorsals grade abruptly to smaller granules. Ventrals are cycloid, smooth, slightly imbricate, and larger than dorsals. Supradigitals are smooth. Verticals at the 10th caudal verticil are in 4–5 rows. The tail bears a single row of enlarged dorsal scales.

Dorsal ground color in males is ash gray to pale coffee-brown with dark spots of slate blue to black dorsally and a short, gray flank stripe. The dorsal spots may fuse to give the effect of broad stripes. The ventral surface is light greenish-yellow to gray. The dewlap is light and greenish-yellow, shading toward orange-yellow just anterior to the center. The dorsum in females is paler than that of males, ranging from gray or olive to light brown. The head is tinged with copper and the dorsal spots are reduced to mottling and smudges. A mottled "ladder" or striped middorsal pattern may be evident. The ventral surface is greenish-yellow with a metallic sheen.

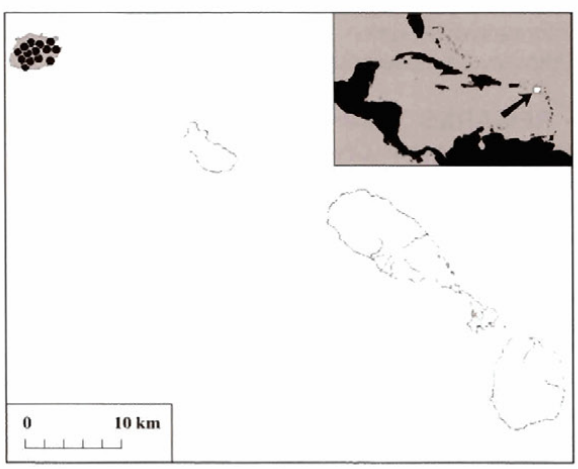
• **DIAGNOSIS**. *Anolis sabanus* can be distinguished from other Lesser Antillean anoles by the combination of smooth ventral scales and the dorsal spotted pattern in males (Schwartz and Henderson 1985).

• **DESCRIPTIONS**. Detailed descriptions are in Lazell (1972), Powell et al. (2005), and Schwartz and Henderson (1991).

Figure 1. An adult male *Anolis sabanus* from along the Crispeen Trail on the slopes of Mt. Scenery (photograph by John S. Parmerlee, Jr.).

• **ILLUSTRATIONS**. Color photographs of *Anolis sabanus* are in Fläschendräger and Wijffels (1996), Malhotra and Thorpe (1999), Obst et al. (1984), Parmerlee (2005), Powell (1999), Powell et al. (2005), Rojer (1997), and van Ditzhuijzen (2004). Black-and-white photographs of individual lizards are in Heselhaus and Schmidt (1990, 1995), Oostveen and Tomey (1975), Powell and Henderson (2005), Staats et al. (1988, frontispiece), and Wijffels (1971). Heselhaus and Schmidt (1995) and Schwartz and Henderson (1985) provided colored drawings. Lazell (1972) provided line drawings of a male and a female. Wijffels (1971) also included a black-and-white photograph of habitat and Powell et al. (2005) provided color photographs of habitat.

• **DISTRIBUTION**. This species is endemic to Saba, Netherlands Antilles. Lizards are abundant in a variety of natural and altered habitats from sea level to the top of Mount Scenery (~870 m), and are rare only in very dry situations (Lazell 1972, Rojer 1997). Staats and Schall (1996a) provided a map on which they noted locations at which lizards infected with malarial parasites had been taken.



Map. *Anolis sabanus* is found islandwide on Saba. The type-locality ("Island of Saba") is too imprecise to plot. Some dots indicate several geographically proximate localitities.

• **FOSSIL RECORD**. None.

• **PERTINENT LITERATURE**. Powell et al. (2005) provided a description and overviews of distribution, natural history, and conservation status. Additional references to *A. sabanus* are arranged by topic: **behavior** (Staats et al. 1998); **diet** (Roehrig 1987); **morphology** (Losos and de Queiroz 1997, Beutell and Losos 1999, Macrini et al. 2003, Roughgarden 1974); **husbandry** (Fläschendräger and Wijffels 1996, Heselhaus and Schmidt 1990, 1995, Nietzke 1978, Slavens and Slavens 1998); **hybrids** (*A. sabanus* x *sagrei* x *gingivinus* in captivity, Mertens 1964); **genetics** (Chakraborty et al. 1978, Fuerst et al. 1977, Gorman 1967, Gorman and Atkins 1969, Schwenk et al. 1982); **natural history** (Oostveen and Tomey 1975, Schwartz and Henderson 1991, Staats et al. 1998); **parasites** (Dobson and Pacala 1992, Dobson et al. 1992, Dobson and Roberts 1994, Goldberg et al. 1997, Perkins 2001, Schall and Staats 1997, 2002, Staats and Schall 1996a,b); and **phylogeny** ((Butler and Losos 1997, Glossip and Losos 1997, Gorman and Atkins 1969, Gorman and Kim 1976, Losos 1990, 1992b, 1994a,b, Roughgarden 1990, Roughgarden et al. 1987, Roughgarden and Pacala 1989, Miles and Dunham 1996, Roughgarden 1974, Schneider 1993, Schneider et. al. 2001, Stenson et al. 2004).

This species is included in guides, checklists, notes (some of which may include brief descriptions), or articles in which the species is merely mentioned by Barbour (1914, 1930a,b, 1935, 1937), Barbour and Loveridge (1929), Censky and Kaiser (1998), Cochran (1938, 1961), Fläschendräger and Wijffels (1996), Frank and Ramus (1995), Hutchins et al. (2003), Losos (1992a), MacLean et al. (1977), Malhotra and Thorpe (1999), O'Hare and Williams (1994), Powell et. al. (1996), Rojer (1997), Savage and Guyer (1989), Schwartz and Henderson (1985, 1988, 1991), Schwartz and Thomas (1975), Sokolov (1998), Underwood (1959, 1962), van Ditzhuijzen (2004), Williams (1972, 1976, 1992, 1999), Williams and Rand (1977), and several online sites, the most informative of which is managed by S.B. Hedges (http://evo.bio.psu.edu/caribherp/).

• **REMARKS**. Guyer and Savage (1987) elevated the anoline genus *Ctenonotus*, into which they (Savage and Guyer 1989) placed *Anolis sabanus*. Although the recognition of the genera elevated by Guyer and Savage (1987) has been advocated by some workers (e.g., Vitt and Zani 1996), we prefer a more conservative approach until concerns regarding generic relationships among anoles (e.g., Williams 1989) have been addressed.

Kruythoff (1938) listed a "tree lizard," "Green Lizard," "Bronze Lizard", and "Speckled Green Lizard" from Saba; all presumably refer to *A. sabanus*, although he used some of the same names for lizards from St. Maarten and St. Eustatius.

• **NOMENCLATURAL HISTORY**. Shortly after Garman (1887) described *A. sabanus*, Boulenger (1887) synonymized the species within *A. leachii*. Only a year later, Günther (1888) synonymized *A. sabanus* with *A. alliaceus*. Barbour (1914) re-elevated *A. sabanus* to full species. Underwood (1959) reduced the Saba population to a subspecies of *A. bimaculatus*, which was generally accepted (see **Comment**) until Lazell (1972) once again elevated *A. sabanus* to full species status.

• **ETYMOLOGY**. The name *sabanus* is in reference to the island of Saba, to which this species is endemic.

• **COMMENT**. Some authors (e.g., Etheridge 1959, Williams 1962, Mertens 1964, Oostveen and Tomey 1975) followed Underwood (1959) in recognizing *A. sabanus* as a subspecies of *A. bimaculatus*; consequently, some allusions to the latter may include references to the former.

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LITERATURE CITED

Barbour, T. 1914. A contribution to the zoögeography of the West Indies, with especial reference to amphibians and reptiles. Mem. Mus. Comp. Zoöl. 44:205–359 + 1 pl.

–. 1930a. The Anoles. I. The forms known to occur on the Neotropical islands. Bull. Mus. Comp. Zoöl. 70:105–144.

–. 1930b. A list of Antillean reptiles and amphibians. Zoologica (N.Y.) 11:61–116.

–. 1935. A second list of Antillean reptiles and amphibians. Zoologica (N.Y.) 19:77–141.

–. 1937. Third list of Antillean reptiles and amphibians. Bull. Mus. Comp. Zoöl. 82:77–166.

– and A. Loveridge. 1929. Typical reptiles and amphibians in the Museum of Comparative Zoölogy. Bull. Mus. Comp. Zoöl. 69:205–360.

Beuttel, K. and J.B. Losos. 1999. Ecological morphology of Caribbean anoles. Herpetol. Monogr. 13:1–28.

Boulenger, G.A. 1887. Reptilia and Batrachia. Zool. Rec. 24:1–34.

Butler, M.A., and J.B. Losos. 1997. Testing for unequal amounts of evolution in a continuous character on different branches of a phylogenetic tree using linear and squared-change parsimony: an example using Lesser Antillean *Anolis* lizards. Evolution 51:1623–1635.

Censky, E.J. and H. Kaiser. 1998. Lesser Antillean herpetofauna, p. 181–221. *In* B.I. Crother (ed.), Caribbean Amphibians and Reptiles. Academic Press, San Diego.

Chakraborty, R., P.A. Fuerst, and M. Nei. 1978. Statistical studies on protein polymorphism in natural populations II. Gene differentiation between populations. Genetics 88:367–390.

Cochran, D.M. 1938. Reptiles and amphibians from the Lesser Antilles collected by Dr. S.T. Danforth. Proc. Biol. Soc. Washington 51:147–156.

–. 1961. Type specimens of reptiles and amphibians

in the U.S. National Museum. Bull. U.S. Natl. Mus. (220):xv + 291 p.
Dobson, A. and S.W. Pacala. 1992. The parasites of *Anolis* lizards in the northern Lesser Antilles, II: The structure of the parasite community. Oecologia 91:118–125.
–, –, J. Roughgarden, E.R. Carper, and E.A. Harris. 1992. The parasites of *Anolis* lizards in the northern Lesser Antilles. I. Patterns of distribution and abundance. Oecologia 91:110–117.
– and M. Roberts. 1994. The population dynamics of parasitic helminth communities. Parasitology 109 (suppl.):S97–S108.
Etheridge, R.E. 1959. The relationships of the anoles (Reptilia: Sauria: Iguanidae): An interpretation based on skeletal morphology. Ph.D. Diss., Univ. Michigan, Ann Arbor.
Fläschendräger, A. and L. Wijffels. 1996. *Anolis* in Biotop und Terrarium. Natur und Tier Verlag, Matthias Schmidt, Münster.
Frank, N. and E. Ramus. 1995. A Complete Guide to Scientific and Common Names of Reptiles and Amphibians of the World. NG Publ., Inc., Pottsville, Pennsylvania.
Fuerst, P.A., R. Chakraborty, and M. Nei. 1978. Statistical studies on protein polymorphism in natural populations I. Distribution of single locus heterozygosity. Genetics 86:455–483.
Garman, S. 1887. On West Indian reptiles: Iguanidæ. Essex. Inst. Bull. 19:25–50.
Glossip, D. and J.B. Losos. 1997. Ecological correlates of number of subdigital lamellae in anoles. Herpetologica 53:192–199.
Goldberg, S.R., C.R. Bursey, and H. Cheam. 1997. Helminths of 12 species of *Anolis* lizards (Polychrotidae) from the Lesser Antilles, West Indies. J. Helminthol. Soc. Wash. 64:248–257.
Gorman G.C. 1967. Studies on the evolution and geography of *Anolis* (Sauria, Iguanidae). Ph.D. Diss., Harvard Univ., Cambridge, Massachusetts.
– and L. Atkins. 1969. The zoogeography of Lesser Antillean *Anolis* lizards - An analysis based upon chromosomes and lactic dehyfrogenases. Bull. Mus. Comp. Zool. 138:53–80.
– and Y.J. Kim. 1976. *Anolis* lizards of the eastern Caribbean: A case study in evolution. II. Genetic relationships and genetic variation of the *bimaculatus* group. Syst. Zool. 25:62–77.
Günther, A.C.L.G. 1888. Notes on frogs and reptiles from Dominica, West Indies. Ann. Mag. Nat. Hist. 2:362–366.
Guyer, C. and J.M. Savage. 1987 ("1986"). Cladistic relationships among anoles (Sauria: Iguanidae). Syst. Zool. 35:509–531.
Heselhaus, R. and M. Schmidt. 1990. Karibische *Anolis*. Herpetologischer Fachverlag, Münster.
– and –. 1995. Caribbean Anoles. T.F.H. Publ., Neptune, New Jersey.
Hutchins, M., J.B. Murphy, and N. Schlager (eds.). 2003. Grzimek's Animal Life Encyclopedia. 2nd ed. Vol.7. Reptiles. Gale Group, Inc., Farmington Hills, Michigan.
Kruythoff, S.J. 1938. The Netherlands Windward Islands and a Few Interesting Items on French St. Martin. A Handbook of Useful Information for Visitor as well as Resident. The Excelsior Printery, Antigua.
Lazell, J.D., Jr. 1972. The anoles (Sauria, Iguanidae) of the Lesser Antilles. Bull. Mus. Comp. Zool. 143: 1–115.
Losos, J.B. 1990. A phylogenetic analysis of character displacement in Caribbean *Anolis* lizards. Evolution 44:558–569.
–. 1992a. A critical comparison of the taxon-cycle and character-displacement models for size evolution of *Anolis* lizards in the Lesser Antilles. Copeia 1992:279–288.
–. 1992b. The evolution of convergent structure in Caribbean *Anolis* communities. Syst. Biol. 41: 403–420.
–. 1994a. Integrative approaches to evolutionary ecology: *Anolis* lizards as model systems. Ann. Rev. Ecol. Syst. 25:467–493.
–. 1994b. Historical contingency and lizard community ecology. p. 319–333. *In* L.J. Vitt and E.R. Pianka, (eds.), Lizard Ecology: Historical and Experimental Perspectives. Princeton Univ. Press, Princeton, New Jersey.
– and K. de Queiroz. 1997. Evolutionary consequences of ecological release in Caribbean *Anolis* lizards. Biol. J. Linn. Soc. 61:459–483.
Maclean, W.P., R. Kellner, and H. Dennis. 1977. Island lists of West Indian amphibians and reptiles. Smithson. Herpetol. Info. Serv. 40:1–47.
Macrini, T.E., D.J. Irschick, and J.B. Losos. 2003. Ecomorphological differences in toepad characteristics between mainland and island anoles. J. Herpetol. 37:52–58.
Malhotra, A. and R.S. Thorpe. 1999. Reptiles and Amphibians of the Eastern Caribbean. Macmillan Educ. Ltd., London.
Mertens, R. 1964. Über Reptilienbastarde, III. Senck. Biol. 45:33–49.
Miles, D.B. and A.E. Dunham. 1996. The paradox of the phylogeny: Character displacement of analyses of body size in island *Anolis*. Evolution 50: 594–603.
Nietzke, G. 1978. Die Terrarien Tiere 2. Eugen Ulmer Verlag, Stuttgart.
Obst, F.J., K. Richter, and U. Jacob. 1984. Lexikon der Terraristik und Herpetologie. Edition Leipzig, Leipzig, Germany (English translation: 1988. The Completely Illustrated Atlas of Reptiles and Amphibians for the Terrarium. T.F.H. Publ., Inc., Neptune City, New Jersey).
O'Hare, R.J. and E.E. Williams. 1994. The *Anolis* Handlist. Hypercard document, Mus. Comp. Zool., Harvard Univ., Cambridge, Massachusetts (see Williams 1992).
Oostveen, H. and W.A. Tomey. 1975. Beobachtungen zur Biologie von *Anolis bimaculatus sabanus* Garmann, 1887. Das Aquarium 75:401–403.
Parmerlee, J.S., Jr. 2005. *Anolis sabanus*. Iguana 12:rear cover photo.
Perkins, S.L. 2001. Phylogeography of Caribbean lizard malaria: Tracing the history of vector-borne

parasites. J. Evol. Biol. 14:34–45.
Powell, R. 1999. Legends to color plates, p. xxi–xxx + 8 pls. *In* B.I. Crother (ed.), Caribbean Amphibians and Reptiles. Academic Press, San Diego.
– and R.W. Henderson. 2005. Conservation status of Lesser Antillean reptiles. Iguana 12:62–77.
–, –, K. Adler, and H.A. Dundee. 1996. An annotated checklist of West Indian amphibians and reptiles, p. 51–93 + 8 pl. *In* R. Powell and R.W. Henderson (eds.), Contributions to West Indian Herpetology: A Tribute to Albert Schwartz. SSAR Contrib. Herpetol., vol. 12, Ithaca, New York.
–, –, and J.S. Parmerlee, Jr. 2005. Reptiles and Amphibians of the Dutch Caribbean: St. Eustatius, Saba, and St. Maarten. St. Eustatius Natl. Parks Found., Gallows Bay, St. Eustatius, Netherlands Antilles.
Roehrig, A.D. 1987. An analysis of sexual differences in diet in the lizard *Anolis sabanus*. M.S. Thesis, College of William and Mary, Williamsburg, Virginia.
Rojer, A. 1997. Biological Inventory of Saba. KNAP Project report 96–10, Carmabi Foundation, Curaçao, Netherlands Antilles.
Roughgarden, J.D. 1974. Niche width: Biogeographic patterns among *Anolis* lizard populations. Amer. Nat. 108:429–442.
–. 1990. Origin of the Eastern Caribbean: Data from reptiles and amphibians, p. 10–26. *In* D. LaRue and G. Draper (eds.), Trans. 12th Caribbean Conf., St. Croix, USVI. Miami Geol. Surv., Miami, Florida.
– and S.W. Pacala. 1989. Taxon cycle among *Anolis* lizard populations: review of the evidence, p. 403–432. *In* D. Otte and J.A. Endler (eds.), Speciation and Its Consequences. Sinauer Assoc. Inc., Sunderland, Massachusetts.
–, S.D. Gaines, and S.W. Pacala. 1987. Supply side ecology: the role of physical transport processes, p. 459–486. *In* P. Giller and J. Gee (eds.), Organization of Communities: Past and Present. Blackwell Sci. Publ., London.
Savage, J.M. and C. Guyer. 1989. Infrageneric classification and species composition of the anole genera, *Anolis, Ctenonotus, Dactyloa, Norops*, and *Semiurus* (Sauria: Iguanidae). Amphib.-Rept. 10:105–116.
Schall, J.J. and C.M. Staats. 1997. Parasites and the evolution of extravagant male characters: *Anolis* lizards on Caribbean islands as a test of the Hamilton-Zuk hypothesis. Oecologia 111:543–548.
– and –. 2002. Virulence of lizard malaria: Three species of *Plasmodium* infecting *Anolis sabanus*, the endemic anole of Saba, Netherlands Antilles. Copeia 2002:39–43.
Schneider, C.J. 1993. Diversification in lizards of the genus *Anolis* from Guadeloupe and the northern Lesser Antilles. Ph.D. Diss., Univ. California, Berkeley.
–, J.B. Losos, and K. de Queiroz. 2001. Evolutionary relationships of the *Anolis bimaculatus* group from the Northern Lesser Antilles. J. Herpetol. 35:1–12.
Schwartz, A. and R.W. Henderson. 1985. A Guide to the Identification of the Amphibians and Reptiles of the West Indies Exclusive of Hispaniola. Milwaukee Pub. Mus., Milwaukee, Wisconsin.
– and –. 1988. West Indian amphibians and reptiles: a check-list. Milwaukee Pub. Mus. Contrib. Biol. Geol. (74):1–264.
– and –. 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville.
– and R. Thomas. 1975. A check-list of West Indian amphibians and reptiles. Carnegie Mus. Nat. Hist. Spec. Publ. (1):1–216.
Schwenk, K., S.K. Sessions, and D.M. Peccinini Seale. 1982. Karyotypes of the basiliscine lizards *Corytophanes cristatus* and *Corytophanes hernandesii*, with comments on the relationship between chromosomal and morphological evolution in lizards. Herpetologica 38:493–501.
Slavens, F.L. and K. Slavens. 1998. Reptiles and Amphibians in Captivity: Breeding - Longevity and Inventory, Current January 1, 1997. Slaveware, Seattle, Washington.
Sokolov, V.E. (ed.). 1988. Dictionary of Animal Names in Five Languages. Russky Yazyk Publ., Moscow.
Staats, C.M., T. Bartolotta, and J.J. Schall. 1998 ("1997"). Body size and perching behavior of *Anolis sabanus*, the solitary anole of Saba, Netherlands Antilles. Herpetol. Nat. Hist. 5:157–163.
– and J.J. Schall. 1996a. Distribution and abundance of two malarial parasites of the endemic *Anolis* lizard of Saba island, Netherlands Antilles. J. Parasitol. 82:409–413.
– and –. 1996b. Malarial parasites (*Plasmodium*) of *Anolis* lizards: biogeography in the Lesser Antilles. Biotropica 28:388–393.
Stenson, A.G., R.S. Thorpe, and A. Malhotra. 2004. Evolutionary differentiation of *bimaculatus* group anoles based on analyses of mtDNA and microsatellite data. Mol. Phylo. Evol. 32:1–10.
Underwood, G. 1959. Part III. Revisionary notes. p. 191–226. *In* J.S. Kenny, V.C. Quesnel, G. Underwood, and E.E. Williams, The anoles of the eastern Caribbean (Sauria, Iguanidae) Parts I–III. Bull. Mus. Comp. Zool. 121:191–226.
–. 1962. Reptiles of the Eastern Caribbean. Carib. Affairs 1:1–192.
van Ditzhuijzen, J. 2004. Eye on St. Maarten Saba St. Eustatius. N&L Publ., Orthomed, Ltd., Belgium.
Vitt, L.J. and P.A. Zani. Ecology of the South American lizard *Norops chrysolepis* (Polychrotidae). Copeia 1996:56–68.
Williams, E.E. 1962. The anoles of the eastern Caribbean: Part IV. The anoles of the northern Leewards, Antigua to Montserrat: new data and a new species. Bull. Mus. Comp. Zool. 127:453–465.
–. 1972. The origin of faunas: evolution of lizard congeners in a complex island fauna - A trial analysis. Evolution 6:47–89.
–. 1976. West Indian anoles: a taxonomic and evolutionary summary 1. Introduction and a species

list. Breviora (440):1–21.
–. 1989. A critique of Guyer and Savage (1986): Cladistic relationships among anoles (Sauria: Iguanidae): are the data available to reclassify the anoles?, p. 433–478. *In* C.A. Woods (ed.), Biogeography of the West Indies: Past, Present, and Future. Sandhill Crane Press, Gainesville, Florida.
–. 1992. The *Anolis* handlist. Museum of Comparative Zoology, Harvard Univ., Cambridge, Massachusetts.
–. 1999. Over 300 years of collecting in the Caribbean, p. 1–30. *In* B.I. Crother (ed.), Caribbean Amphibians and Reptiles. Academic Press, San Diego.
– and A.S. Rand. 1977. Species recognition, dewlap function, and faunal size. Amer. Zool. 17:261–270.
Wijffels, L.C.M. 1971. Enige notities over *Anolis bimaculatus sabanus* Garman, 1887 en zijn natuurlijk voorkomen. Lacerta 30(1):7–9.

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